

MOSAIC OF ASTRONOMICAL OUTLOOK



*Network
for Astronomy
School Education*

**Proceedings of the 1st Seminar on
NASE Practical Astronomy Education**

Editor: Rosa M. Ros

Bogotá, Colombia, 11th October 2016



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Network for Astronomy School Education

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International
Astronomical Union

Bogotá, Colombia, 11th October 2016

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Introduction

The Network for Astronomy School Education Project (NASE) has its origins in the International Year of Astronomy in 2009 (IYA 2009), and was developed in response to the International Astronomical Union's (IAU) recent 10 Years Strategic Plan to increase the efforts of the IAU in primary and secondary schools around the world. NASE's mission is to stimulate teaching astronomy in schools, through the professional development of primary and secondary school science teachers in developing and emerging countries. NASE's organizational principle is to build capacity by providing courses for three years in cooperation with a Local Organising Committee (LOCAL NASE GROUP). The Local NASE Group is composed of university professors and education professionals within a country or region within a country, who promote astronomy activities and organize courses and workshops for teachers in their region of their country. Since the first course in 2009, there have been about 100 NASE workshops held in the Americas, Europe, Africa, and Asia, and the texts are available in English, Spanish, Chinese, Portuguese, Rumanian, and Indonesian, with more to come.

NASE's philosophy is to provide hands-on activities that explain fundamental concepts like why the Earth has seasons, the phases of the moon, what are planets, how do stars form, the expanding universe, how we learn about the universe from the different wavelengths of light, and how astronomy integrates with culture. NASE's emphasizes accessibility and direct experiences, and therefore provides a wealth of activities that can be carried out with inexpensive, quotidian materials available to every student world wide, supported by an explanatory text and ready-made presentations for teachers to use.

NASE strongly encourages workshop participants to share their experiences and lessons with the NASE community through local activities and by posting curriculum materials on the NASE webpages. This conference held in Bogota, Colombia on 11 October 2016, brings together for the first time NASE instructors and teachers to share and communicate their experiences. These conference proceedings reflect the dedication of the NASE community to teach astronomy to our young people, preparing them to be scientifically literate citizens of the world, and the next generation of scientists, and are the concrete record of this important mission.

Respectfully,
Susana Deustua, PhD
Vice-President, Division C (Education, Outreach and Heritage) of the IAU.

President's Message

This is a message of thanks to all members of NASE collaborating in the development of this program, particularly in the countries of Spanish and Portuguese speaking. After several years of tireless work by everyone we are beginning to collect the results.

This publication contains the reports of the 15 countries involved in NASE as working material devoted to those members who attend the First Seminar on Practical Teaching of Astronomy NASE. During the sessions of this meeting we will study some aspects to be improved as well as the strengths of the program.

We hope that this meeting allows a new projection of NASE with more courage and more strength if possible. The desire of NASE's program is to reach many more countries in the best way

We must acknowledge the work of all the authors who have participated in the drafting of reports and for Bogota Planetarium for helping us greatly in the aspects of local organization And we thanks the co-operation of Medellin Planetarium, Institución Universitaria ITM and MCNS.

Dr. Rosa M. Ros
NASE President

INDEX

	<i>Pag</i>
PROGRAM	11
<i>NASE evolution from its beginnings to the present</i>	13
Rosa M. Ros	
<i>NASE Quality System Certification</i>	21
Beatriz García, Delia S. Santa Maria	
COUNTRIES	29
1. <i>Argentina</i>	
Beatriz García	31
2. <i>Bolivia</i>	
Ruth Soria	32
3. <i>Brazil</i>	
Ana M. Pereira, Fabiano Pavoni, Janer Vilaça	35
4. <i>Colombia</i>	
Orlando Méndez, Mauricio Giraldo, Angela P. Pérez, Jhonattan Pisco	36

5.	<i>Cuba</i>	
	Taymi García	38
6.	<i>Ecuador</i>	
	Nicolás Vasquez, Santiago Bernal	39
7.	<i>Guatemala</i>	
	Edgar A. Cifuentes	40
8.	<i>Honduras</i>	
	Ricardo Pastrana	41
9.	<i>México</i>	
	César Augusta Mtz Rocha	43
10.	<i>Nicaragua</i>	
	Ligia Areas	44
11.	<i>Panama</i>	
	Eduardo Chung	48
12.	<i>Paraguay</i>	
	Marta E. Navarro	49
13.	<i>Peru</i>	
	José Ishitsuka	50
14.	<i>Spain</i>	
	Rosa M. Ros	53
15.	<i>Uruguay</i>	
	Reina Pintós	54
	NASE PUBLICATIONS	55

**First Seminar on
NASE Practical Astronomy Education**

**Bogota Planetarium, Colombia
11th October 2016**

PROGRAM

8:30 - 9:00 – Delivery of documentation

9:00 - 9:30 – Opening session

9:30 - 12:00 – Oral presentations

12:00 -14:00 – Lunch

14:00 - 17:00 – Working Groups

17:00 - 17:30 – Conclusions

17:30 - 18:00 – Closing session

18:00 - 19:00 – Visit to Bogota Planetarium

NASE evolution from its beginnings to the present

Rosa M. Ros

NASE President, Technical University of Catalonia, Barcelona, Spain

NASE was born in 2010 after a couple of pilot courses conducted in collaboration with UNESCO during the International Year of Astronomy 2009. After seven years of continuous work mainly in Central and South America, it is time to carry out an overall review of the project to begin a new phase with renewed and stronger forces.

If NASE was initially established in the Americans countries it was not merely by chance but was the result of a clear desire from the NASE presidency to organize courses for teachers in the language of the country. No doubt the American continent has a great advantage over others, and that is that with two or three languages we can easily operate. We started with materials translated into Spanish, English and Portuguese. This is what has enabled a progressive, active and dynamic launch in these years and achieve difficult objectives carried out in another geographical location. Having to translate materials to a language in almost every country would have consumed a lot of energy in the period of foundation and sedimentation.

We must also recognize that making contacts has been easier on this continent due to the cultural and geographical proximity of the two people who are in charge of the program: president and vice president.



Fig. 1: NASE Courses until August 2016

MAIN OBJECTIVES

From the beginning, NASE objectives have been bringing astronomy to schools to enhance their knowledge and by means of this method taking a different approach to science. NASE offers a new methodology that presents astronomy experimentally and in close proximity. By taking advantage of the fact that astronomy provides an easy

path to the observation of the heavens, because above each school there is sky and it is also a branch of science, perhaps the only one which arouses people's interest and particularly among young people. But to bring astronomy to schools it is necessary to start training teachers. Teachers do not teach something they do not know and few make observations if they are not encouraged previously by means of practical examples. The new methodology has sparked interest in many teachers who see the activities of the workshops as an option in their astronomy classes or subjects related to astronomy. In addition, active participation in promoting models and observations means that astronomy clubs located in many countries are interested in NASE.

It has been of great benefit for the courses to be supported by the IAU, which also requires all instructors with a high level of preparation in the content. In consequence, it is clear that instructors cannot give different contents that NASE establishes and regulates. Also NASE guarantees a common level professionalism in all courses in relation to their content and format.

WORK DEVELOPMENT

The work is developing continuously in most countries. The first local groups helped create others groups in their own country or in neighboring countries and also hotlines established collaboration from NASE's headquarters. NASE is a network of people who know each other.

In the texts that follow this introduction, details of the various situations of each local group will be given. In some countries they are working in coordination with the Ministry of Education, so NASE courses are approved as part of teachers' professional training, this is the case in Honduras and Bolivia. Even the Ministry of Education in Bolivia has published NASE's book and distributed it to all schools in the country.

Most local groups have organized courses throughout the country to reach more teachers in remote areas and sometimes with transportation problems. This is the case of Ecuador, Guatemala, Nicaragua, Paraguay and Peru. In larger countries the number of local groups has been multiplied through collaboration between them, so for example, Argentina currently has seven groups of NASE, in Colombia they have already formed four groups and in Mexico they are working towards creating a set of three groups for next year.

The courses continue to develop in Uruguay, where there is a long tradition of education in astronomy. NASE is waiting for their collaboration in the development of courses elsewhere. In Cuba they are starting the work of NASE with a very motivated group focused on planetarium of Havana and, in the future they will develop their activities independently. In Brazil, it has translated the whole course into Portuguese and we hope to publish the NASE book in this country or in Portugal. The latter country has joined to NASE now and they will begin their courses from next year.

Next year we will start courses in Chile, where so far no contact had been made, and try to recover the courses in Panama where for various local causes there have been interruptions. Concerning Central and South American we only need to get to Costa Rica, El Salvador and Venezuela, where they are beginning to make contacts to that end.

It is our mission that this development continues and we maximize the value of astronomy teaching as an enhancer of new scientific vocations.

CULTURAL ASTRONOMY OR ASTRONOMY IN THE CITY

NASE has a clear commitment to establish solid contact channels between astronomy and culture through astronomical visits. It is a way to show teachers the cultural richness of their astronomical community. Teachers can show this to their students in order to return to society again with a lively and motivating presence. On the website NASE listed a number of examples of these visits and their promotion is a distinctive example of the quality of NASE courses. http://sac.csic.es/astrosecundaria/es/astronomia_en_la_ciudad/Lista.php

EVALUATIONS

Three types of evaluation has been performed through the years

- A pre and post assessment of teachers who take the course.
- A satisfaction survey of those attending the course on the final day
- A deferred evaluation in time to know the application and use of the course content

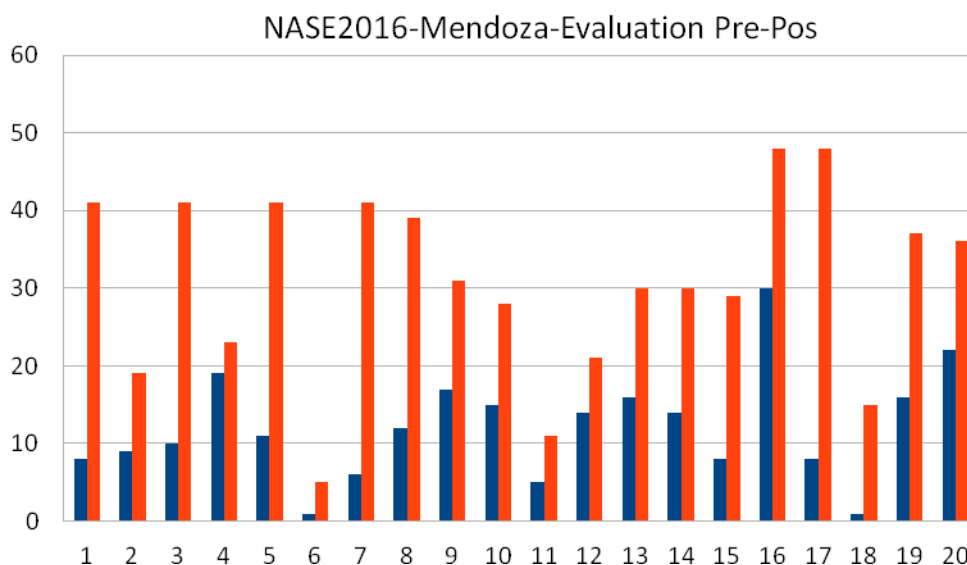


Fig. 2: Pre-post evaluation of the course held in Mendoza in August 2016. In blue the results before the course and in orange the results after the course.

Several evidences of the utilization of learning can be found on NASE' website: <https://issuu.com/nase.networkastronomyschooledu/stacks>

As an example we present the pre-post evaluation of the last course that has taken place just before to write this introduction. In blue pre-course knowledge and in orange color the subsequent knowledge.

Once completed the course, the satisfaction survey collects, among others, a couple of issues that we consider crucial to summarize the course.

The first one we show here is about the level of activities. As seen in figure 3 in all courses the majority percentage is satisfactory (on average more than 80%). In some courses appears a small percentage (generally less than 20%) that considers the course is aimed at excessively high level. And there are almost negligible cases considering that the level is too low (figure 3).

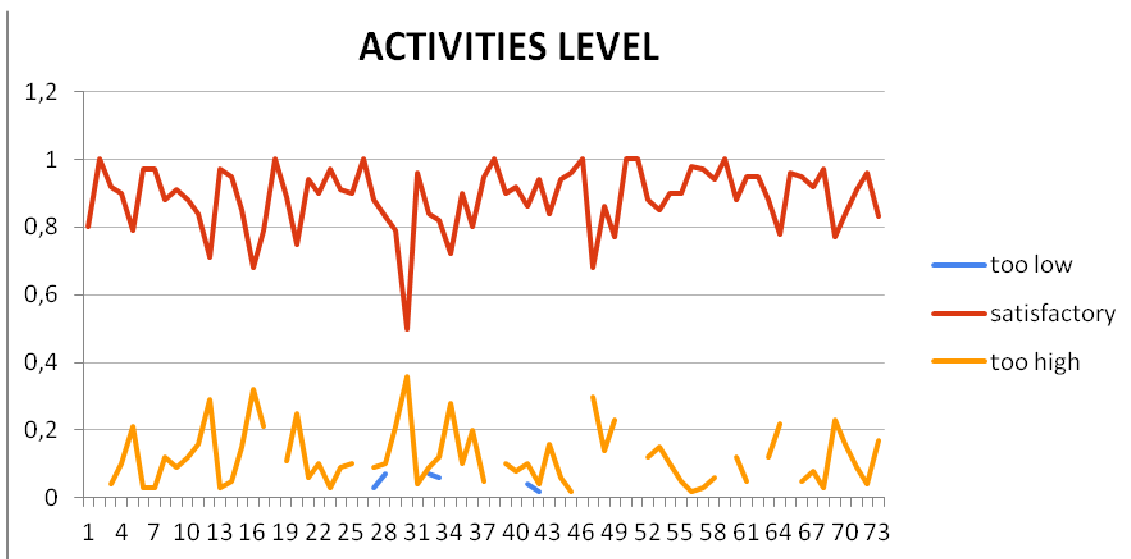


Fig. 3: In all courses, the majority of participants value the level as satisfactory. A few teachers consider them too high. And those who consider the level too low are practically imperceptible.

Another key question is related to the utility. After reading the surveys of all participating teachers, 99.8% of them believe that the course contents are very useful or useful and only 0.2% believe it is unhelpful (figure 4).

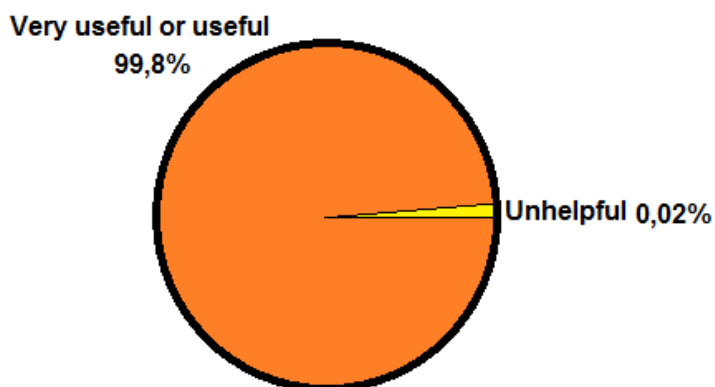


Fig.4: Percentages about the usefulness of the courses

From the point of view of NASE, the most interesting questionnaire is the deferred survey. This is answered after one, two or more years, it is about the opinion of the participants after the expiry of this period of time and when they have used their knowledge with students and can see in reality what is useful in daily classes.

The questionnaire is very comprehensive, but here we only give some items of the deferred survey as an example, considering the importance of the issue demanded (figures 5 and 6). For example we asked if they have applied the learned topics and if they have used the documentation received. The percentages are excellent. It should be mentioned that participants who have not used them, explained in a supplementary question that the reason are: a) They are not giving courses in astronomy or related to astronomy b) because they are not acting as teachers for different reasons.

Another interesting issue has been their opinion about astronomy. The question was: If their opinion changed after the course or not. Mostly they respond that their opinion had changed and they believe that astronomy is easier and affordable.

In addition, we asked why they changed their opinion. Participants say they discovered that astronomy was really accessible. Before the course they believed that astronomy was too complicated to introduce in schools. After the NASE course they had very good results in terms of comprehension and motivation. They realized that it is a topic that students want to know more and it can be used to interest them in other scientific contents

Have you applied any of the issues presented?	
Yes	No
90%	10%
Have you used the documentation provided during training?	
Yes	No
94%	6%
After the course, has your concept about astronomy changed?	
Yes	No
88%	12%

Fig. 5: After at least one or two years, we ask again for the usefulness of the course and if their idea about astronomy changed after following the course

¿ Which of the final objectives of the project do you think are really covered by the lessons?		
	Yes	No
Using astronomy to promote education and provide pupils with skills in science and technology worldwide	100%	0%
Promoting respect for cultural astronomy and learn the presence of astronomy in daily life	94%	6%

Fig. 6: About the achievement of the course objectives.

Finally, It notes that the concept of astronomy is very positive and the introduction of cultural astronomy gives good results too (figure 6).

THE NUMBERS WHICH SUMMARIZE THE NASE PROJECT

One of the ways to evaluate the results of the project is the numerical data. Up to late August 2016 we have developed 86 courses in which 3,496 teachers have participated and it has involved, a greater or lesser extent, 2,606,500 students (considering that each teacher usually has an average of 200 students per course). NASE has been established in 21 countries with 34 local working groups that bring together 439 volunteers (45 IAU members and 394 non-members). Finally we add the list of courses until now.

Country	From	Local Groups	Courses	Teachers	Students
Argentina	2010	7	15	607	473400
Bolivia	2012	2	4	317	219200
Brazil	2012	3	3	123	98400
China	2013	1	1	45	36000
Colombia	2009	4	13	420	340400
Cuba	2014	1	1	24	14400
Ecuador	2009	1	6	225	171200
Spain	2016	1	1	23	4600
Ghana	2013	1	2	50	34 800
Guatemala	2012	1	5	261	149400
Honduras	2011	1	7	321	226000
Indonesia	2016	1	1	29	5800
Kenya	2013	1	1	20	16 000
Nicaragua	2010	1	7	270	231400
Mexico	2013	1	3	137	58000
Panama	2011	1	1	48	57600
Paraguay	2011	1	4	143	109000
Peru	2009	2	6	291	258500
Romania	2014	1	1	43	25800
Uruguay	2012	1	3	81	69400
USA	2015	1	1	18	7200
21		34	86	3496	2606500

Table 1: NASE courses up to August 2016

LIST OF NASE COURSES

- 1st Lima (Perú)- July 17-20, 2009
- 2nd Salinas (Ecuador)- July 18-21, 2009
- 3rd Barranquilla (Colombia) - July 6-9, 2010
- 4th Managua (Nicaragua) - July 12-15, 2010
- 5th Lima (Perú) - July 17-20, 2010
- 6th Rosario (Argentina) - October 12-15, 2010
- 7th Cañada de Gómez (Arg) - October 13-15, 2010

- 8th Venado Tuerto (Argentina) - May 26-28, 2011
- 9th Rafaela (Argentina) - June 22-25, 2011
- 10th Tegucigalpa (Honduras) - July 11-14, 2011
- 11th Managua (Nicaragua) - July 11-14, 2011
- 12th Panamá (Panamá) - July 18-22, 2011
- 13th Barranquilla (Colombia) - July 21-24, 2011
- 14th Asunción (Paraguay) - July 27-30, 2011
- 15th Reconquista (Argentina) - November 2-5, 2011
- 16th Lima (Perú) - January 18-21, 2012
- 17th Managua (Nicaragua) - July 2-6, 2012
- 18th Tegucigalpa (Honduras) - July 9-12, 2012
- 19th Guatemala (Guatemala) - July 10-13, 2012
- 20th Quito (Ecuador) - October 23-26, 2012
- 21th La Paz (Bolivia) - October 29- November 1, 2012
- 22th Barranquilla (Colombia) - November 14-16, 2012
- 23th Santa Fe (Argentina)- November 19-21, 2012
- 24th Asunción (Paraguay) - November 21-24, 2012
- 25th Montevideo (Uruguay) - November 26-29, 2012
- 26th Accra (Ghana) - January 8-11, 2013
- 27th Cañada de Gómez (Argentina) - March 12-15, 2013
- 28th Mendoza (Argentina) - March 18-20, 2013
- 29th Cochabamba (Bolivia) - July 16-18, 2013
- 30th Uberlandia (Brasil) - July 29- August 1, 2013
- 31th Foz de Iguazu (Brasil) - August 5-8, 2013
- 32th Bauru (Brasil) - August 12-15, 2013
- 33th Managua (Nicaragua) - August 5-7, 2013
- 34th Beijing (China) - August 19-21, 2013
- 35th Medellín (Colombia) - September 2-5, 2013
- 36th Bogota (Colombia) - September 2-5, 2013
- 37th Quito (Ecuador) - September 23-26, 2013
- 38th Barraquilla (Colombia) - October 8-10, 2013
- 39th Nairobi (Kenya) - October 24-26, 2013
- 40th Tegucigalpa (Honduras) - November 4-7, 2013
- 41th Guatemala (Guatemala) - November 11-13, 2013
- 42th San Luis Potosí (México) - November 19-22, 2013
- 43th Montevideo (Uruguay) - December 2-5, 2013
- 44th Huancayo (Perú) - March 17-20, 2014
- 45th Ica (Perú) - March 24-27, 2014
- 46th Mendoza (Argentina) - April 24-26, 2014
- 47th Cluj (Rumania) - April 24-26, 2014
- 48th La Habana (Cuba) - June 9-12, 2014
- 49th Bogotá (Colombia) - June 16-19, 2014
- 50th Quito (Ecuador) - June 16-19, 2014
- 51th Medellín (Colombia) - June 25-28, 2014
- 52th Accra (Ghana) - July 28-31, 2014
- 53th Asunción (Paraguay) - July 30 - August 1, 2014
- 54th Barranquilla (Colombia) - July 31 - August 1, 2014
- 55th Salta (Argentina) - August 12-14, 2014
- 56th Tegucigalpa (Honduras) - October 23-24, 2014
- 57th Cochabamba (Bolivia) - October 27-28, 2014

- 58th Guatemala (Guatemala) - November 3-5, 2014
- 59th Oruro (Bolivia) - November 4-7, 2014
- 60th Managua (Nicaragua) - December 10-12, 2014
- 61st Lima (Perú) – February 3-13, 2015
- 62th Barranquilla (Colombia) – March 19-21, 2015
- 63th Tucumán (Argentina) – March 25-27, 2015
- 64th Cuenca (Ecuador) – March 25-27, 2015
- 65th Jujuy (Argentina) – May 11-13, 2015
- 66th Medellín (Colombia) – June 24-27, 2015
- 67th Guatemala (Guatemala) – June 25-27, 2015
- 68th Managua (Nicaragua) – July 13-15, 2015
- 69th Honolulu (USA) – August 1-2, 2015
- 70th Tegucigalpa (Honduras)- August 24-27, 2015
- 71th Bogotá (Colombia) – October 5-7, 2015
- 72th Bucaramanga (Colombia) – October 11-14, 2015
- 73th Salta (Argentina) – November 2-5, 2015
- 74th Concordia (Argentina) – November 18-20, 2015
- 75th Rosario (Uruguay) – December 1-3, 2015
- 76th Tegucigalpa (Honduras) – February 24 – May, 2016
- 77th Macas (Ecuador) – April 4-8, 2016
- 78th San Luis Potosí (México) - May 31 - June 3, 2016
- 79th Matehuala (México) - June 6-9, 2016
- 80th Guatemala (Guatemala) - June 23-25, 2016
- 81th Managua (Nicaragua) - July 12-15, 2016
- 82th Malang (Indonesia) - July 25-28, 2016
- 83th Pamplona (España) - July 26-29, 2016
- 84th Mendoza (Argentina) – August 10 -12, 2016
- 85th Villarubia (Paraguay) – August 13-27, 2016
- 86th Tegucigalpa (Honduras) – August 20-25, 2016

NASE Quality System Certification

Beatriz García, Delia S. Santa María

NASE Vicepresident, Instituto de Tecnologías en Detección y Astropartículas (CNEA, CONICET, UNSAM), Mendoza, Argentina

The Quality Systems are based on rules aimed to improving processes within organizations. The most used are the standards issues emitted by the International Organization for Standardization (ISO) regarding the implementation of quality systems through the family of ISO 9000. The ISO is an independent, non-governmental organization formed by the standards organizations of its 164 member countries. It is the world's largest developer of voluntary international standards and facilitates activities worldwide by providing common standards between countries. They have been established near twenty thousand standards covering various fields including education.

THE STANDARDS

The implementation of quality systems aims to improve products, services or processes in various fields of activity. In this respect, quality systems are related to rules that determine the conditions to perform a process or the characteristics of the product or service in question. Thus, if the product or service is performed according to the reference standard, one can say that it meets quality standards of this regulation and, once passed the corresponding audits, you can obtain the certificate. Quality systems have been developed for many areas of activity. The use of standards facilitates the creation of products and services that are safe and reliable. The Standards help to increase productivity while minimizing errors and expenses.

The Quality is a long-term strategy, aimed to provide goods and services to fully satisfy both external and internal customers to suit their explicit and implicit expectations, using the knowledge and skills of all employees of the organization to get benefits for the organization.

The quality is approached from two perspectives: external and internal. The first considers quality as something that creates value to the user, to the extent that the product or service meets your expectations and maintaining good relations between the management of the organization and participants and stakeholders; and the second is based on the identification of a strategy that mobilizes the entire organization to achieve optimization of all operations, a cultural change and the internal transformation, necessary to maintain or achieve a competitive position.

A new ISO standard aims to improve the quality of supply on the world market that has grown around education and non-formal training, such as vocational training, lifelong learning and training into the company.

ISO 29990: 2010, Learning services for education and non-formal training - Basic requirements for service providers, aims to improve the quality of supply in the growing global market around education and non-formal training, offering a unique alternative backed by

international consensus to the huge variety of standard services and management that now exists in the field of non-formal learning.

The growing economic importance of learning in the global knowledge society has created new opportunities such as the activity related to the provision of learning services for profit. Therefore, quality assurance becomes a crucial issue.

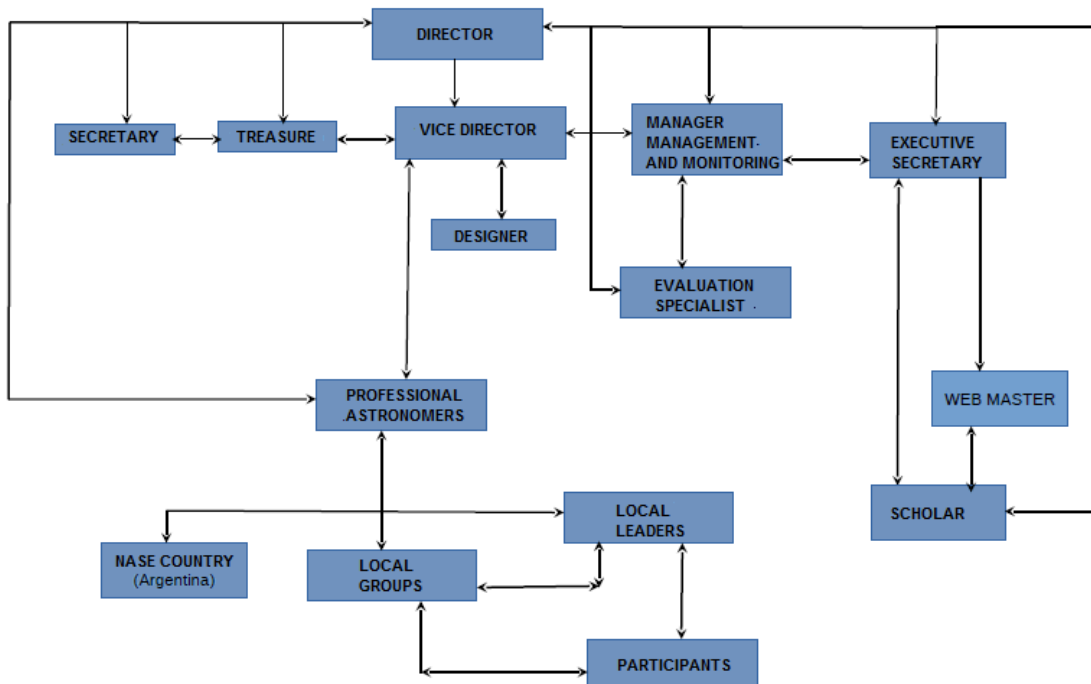


Fig. 1: NASE Organizational Structure

NASE QUALITY ASSURANCE POLITICS

NASE Management System of Learning Services has been developed according to the IRAM-ISO 29990: 2013 standards, which means about "Learning services for non-formal education and training and basic requirements for learning service providers (LSP), in order to achieve compliance with certain goals and achieve concrete results that comply with an applicable standard worldwide.

In that sense, it was refreshing to discover that NASE suited perfectly to the requirements of this international standard that ensures not only the quality of the teaching-learning processes, but also a method for evaluating the service, ensure continuous improvement and from specific indicators quantitatively analyze the impact of activity

As part of the Quality Politics, NASE should define goals and concrete results in regard to:

- ✔ Teach to teach astronomy to professors from primary, secondary and in some cases the tertiary level (science professorships) and students at the basic cycle of university careers, within a practical framework, with emphasis on the development of workshops and laboratories.

- ✓ Provide the teachers the specific practical tools to use astronomical topics in different curriculum areas, using the concepts of discipline, but applying the techniques in areas such as Mathematics, Physics, Chemistry, Biology, Geography, History, Philosophy.
- ✓ Promote the teaching of the Astronomy forming the primary, secondary and university / tertiary teachers.
- ✓ Encourage the Astronomy teaching / learning active process by observing patterns and phenomena.
- ✓ Set up in each province that requires the Service, a Local NASE Group of local teachers to give the basic course and prepare materials for the web program, continuously.

In its commitment to: Work according to the needs and requirements of society ensuring the proposed goals:

- ✓ Provide a service oriented to the customer satisfaction and to the quality requirements
- ✓ Assure a better training of teachers - students, with a maximum efficiency in the process .
- ✓ Orientate the processes to the continuous improvement from the clear definition of process indicators, evaluation and promotion of special activities by trainers and trained teachers.

The organizational structure (see Figures 1 and 4) ensures the continuity of the task and feedback from the steering authorities, ensuring continuous improvement processes.

On the other hand, a quality management system requires the definition of the Vision and the Mission. NASE has proposed the following Mission and Vision:

MISION

- Promote the teaching of astronomy forming teachers (secondary and primary).
- Encourage the active teaching / learning process of astronomy by observing patterns and phenomena.
- Motivate teachers and students to observe the natural world and especially to associate these observations with astronomical topics.
- Establish in each province a Local NASE group of teachers which give the basic course and prepare materials for the web of the Working Group continuously, ensuring the survival of the course in the world and the constant updating of the supplementary teaching materials.

VISION

The NASE program intend to become the benchmark in Didactics of Astronomy training for mid-level teachers in the country

SCOPE OF LEARNIN SYSTEM

NASE Learning System reaches activities related to the teaching of astronomy in the primary and secondary levels of education and, in some cases, at university level.

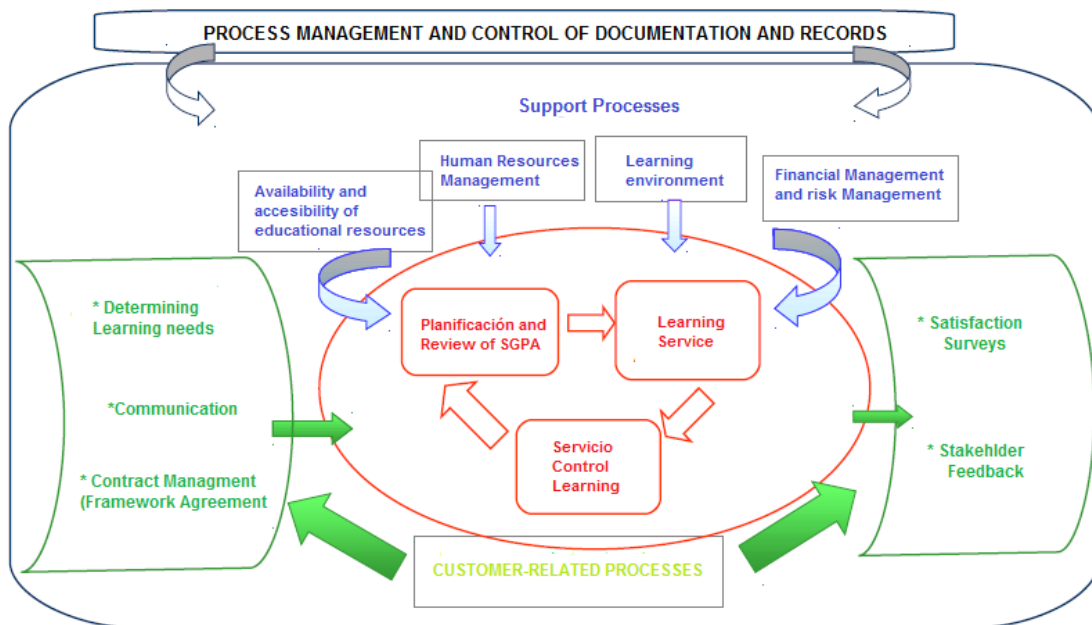


Fig. 2: NASE General Processes Map

As was previously described, the topics included at the course are: Solar System, Earth-Moon-Sun, Solar spectrum, Stellar evolution, Astronomy outside the visible Expansion of the universe, Cosmology, History of Astronomy, observation and Astronomy in culture and everyday life. These topics cover the broad spectrum of content of Astronomy and Astrophysics that make the body of ideas that can display Astronomy as a cross-discipline to all sciences and thus applicable in all areas of natural and social sciences at school .

The general NASE teaching/learning process, ensures not only the training of a small group of teachers, but its projection and continuity. The general working scheme (figures 2, 3 and 5).

Thus, we consider of the strategic importance to sustain the promotion of NASE workshops from the various tools available, either from the quality certification process and from government agencies.

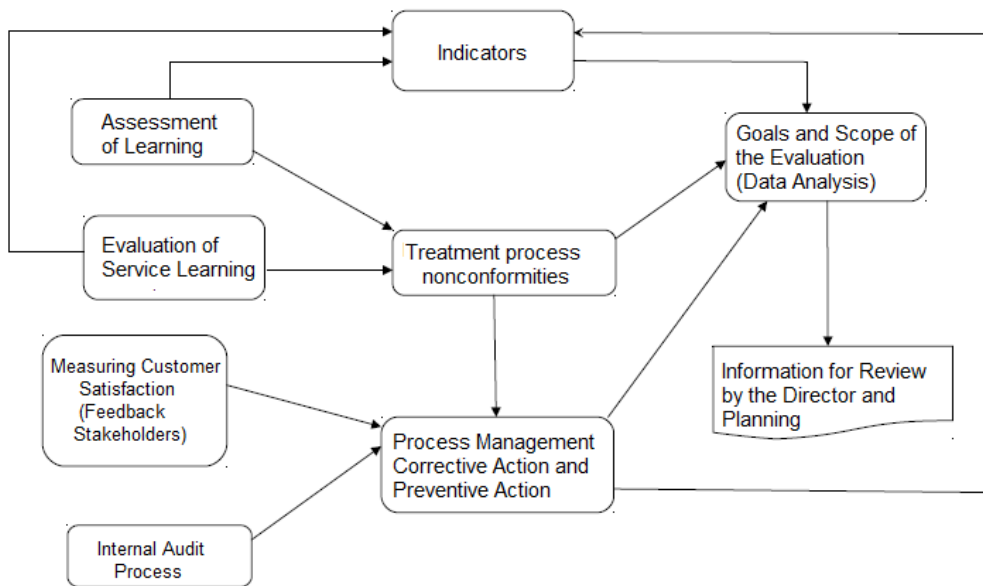


Fig 3: Control of Processes: Service Evaluation, Client Satisfaction, Audits

NASE IN ARGENTINA AND THE ASSURANCE QUALITY SYSTEM

All countries that are part of NASE are governed by the same dynamics and structures but to certify the quality standards the president of NASE has decided to certify first in the country where the program NASE is more widespread and where they have developed more courses, this is in Argentina. In spite that, the documentation can be very easily extended to other countries changed a few specific details.

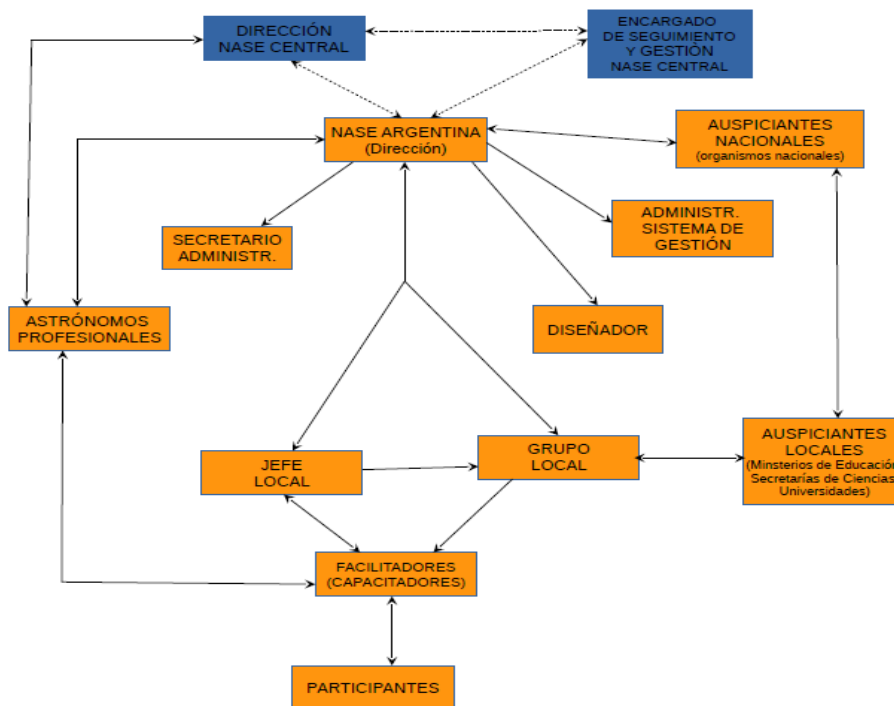


Fig. 4: NASE Argentina Structure

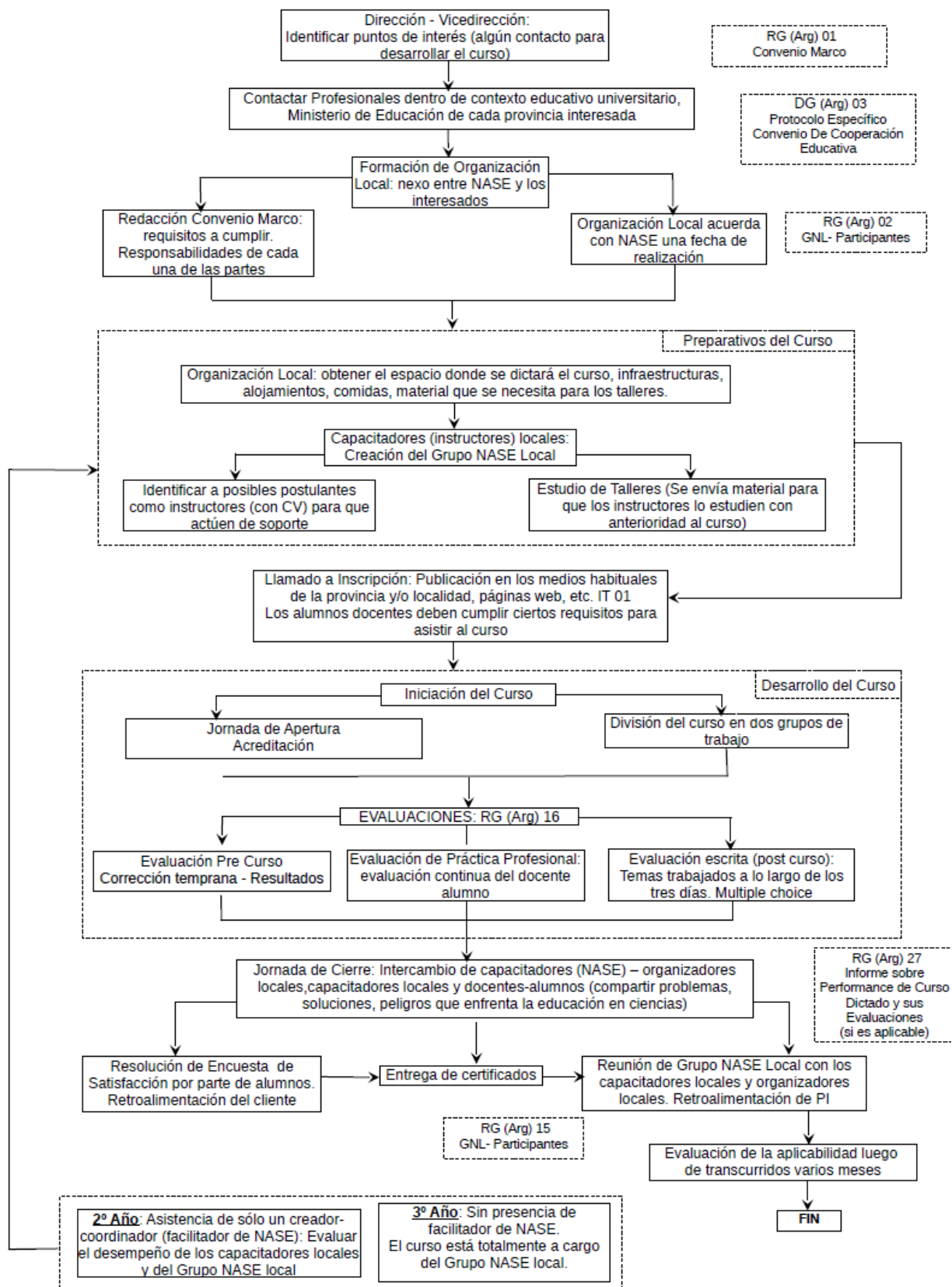


Fig. 5: Process Map Service Delivery Learning NASE-Argentina

The ISO29990 standard is applicable worldwide. The development of Quality Management System in one of the countries in which the NASE program is broadly develops demonstrates the power of the proposal, the quality of its content and the ease adaptation of the project to an international standard. In that sense, it is expected that NASE Local Groups adopt this proposal and apply the acquired knowledge in Argentina in what makes this line of work in every country in which NASE develops, since the standard scope is international.

It should be noted the fact that certification can, in some cases, secure international financing and is one of the requirements imposed by various universities and organizations in the world to adopt a specific educational proposal.

In this way Argentina is opening a way to the establishment of certification in other countries, although NASE arises do not make this documentation for all 21 member countries because the financial investment that this represents. The increasing economic importance of the learning in the global knowledge society has created new opportunities such us the activity connected to the learning services with profit purposes. For this, the quality warranty becomes a crucial topic.

Reports from Spanish-speaking or Portuguese speaking NASE countries

Informe de Argentina

Beatriz García

Vicepresidente de NASE, Instituto de Tecnologías en Detección y Astropartículas (CNEA, CONICET, UNSAM), Mendoza, Argentina

In Argentina the Astronomy is included in the curriculum of primary and secondary level of education. In general, teachers of Physics and Mathematics have received some training in astronomy during their formation. In that way, was possible to form Local NASE Groups in the country, appealing to the training that ensures the basic content knowledge of the concepts, required to begin the NASE training, a project of scientific communication and part of the premise that Astronomy is always easy to understand if the contents are correctly adapted and the appropriate tools are used.

In the country several NASE Local Grus have been consolidated in the provinces of Santa Fe (where they have been issued workshops on 7 opportunities), Mendoza (3 courses), Salta (2 courses), Jujuy (two courses), Tucuman (in one opportunity) and Entre Rios (2 courses), under the auspices of the National Research Council of Scientific Reseach (CONICET) and its "VoCar" program. In these 15 courses, we have trained about 600 teachers who in turn, are multipliers of experiences.

NASE is always a positive resource, from any of the approaches to the program. For trainers is a very productive exchange space and a motivation to do "something different" with science, putting the Astronomy at the fingertips of teachers, who then applied this knowledge in the classroom. For the teachers-students, it is a resource to apply directly in the classroom and an interdisciplinary approach that offers astronomy as an excuse to learn about Natural Sciences (Physics, Mechanics, Astrophysics), Social Sciences (with the history of Astronomy, the archaeoastronomy, Cosmology of indigenous peoples), Mathematics, Technology, just to mention some disciplines. In the case of children and young people, students of teachers who took the course, this activity represents the opportunity to attend a different class, where they can make instruments, perform observations or to reinforce concepts by experimentation.

Many teachers who participated in NASE experience, used the methodology and materials at classroom experiences with students of different levels, but also were enhanced activities related to Science Fairs, Astronomy clubs and community projects.

The general opinion of teachers involved NASE is that while it has done a lot of training and have even been trainers, none has been so significant. These workshops are different from every point of view: organization, dictation, quality, intensity, content and participation. The dynamics and format are novel and the possibility of joining local groups encourages, and is the way to maintain the existence of the courses.

NASE-Bolivia, activities from 2012 to 2016

Ruth Soria

Cochabamba University, Cochabamba, Bolivia

Astronomy outreach in Bolivia has taken place for a long time. It was important to share astronomy knowledge with as many people as possible; however, the results may be summarized in a few sentences:

- There are several amateur astronomy clubs who support this science but members are only those who are educated and at the minimum, possess a telescope.
- There are universities and schools around the country, primarily in capital cities, which have planetariums, are available to students in those areas, but these do not exist in medium sized and smaller cities or village. In recent years we have seen an increase in the number of private and institutional mobile planetariums but whose immediate goal is recovering costs or justifying the existence of a particular program rather than general outreach in astronomy.
- The international science Olympiads, which include astronomy as one area of the competition, show that except in a few cases, and despite the original effort of including less affluent regions and enabling them to reach a competitive level, only a handful of city schools are able to win medals. However, it is important to mention that aside from the controversial contribution to education, the science Olympiads have reached one of their goals: students discovered a wonderful science only mentioned as a footnote in the classroom and teachers realized the need to learn about astronomy in order to be able to answer questions from ever eager and curious students. The NASE courses have not only demonstrated that they needed to learn more, but also that they longed to learn.

NASE Bolivia was formed thanks to Rosa María Ros interest in organizing a workshop in Bolivia at the end of 2012. That year the Bolivian Society of Physics (SOBOFI) supported the Max Schreir Planetarium, a unit of the Universidad Mayor de San Andrés (UMSA), in the organization of the course held in La Paz from October 29 to November 1st. Although only 24 people attended the course, it was very interesting because there were university professors as well as technical staff from the Tarija Observatory. Under the supervision of Rosa Maria Ros and Beatriz Garcia, the first group of Bolivian instructors was created, the base of the NASE Bolivia group.

In 2013 a workshop took place in Cochabamba from July 16 to July 18, with support from the Universidad Mayor de San Simón (UMSS) and the Swedish Research Cooperation. This was the first conference in which the hunger of Bolivian teachers for this type of program was clearly manifest. Beatriz Garcia supervised the course, and witnessed with us the emotion we felt at admitting one teacher who had come from the provinces in order to learn how to teach astronomy. The course had 97 participants, 80% of whom were rural area teachers responsible for teaching with adolescents from 12 to 17 years of age. The work was enormous, but worth the effort, as the enthusiasm generated by the NASE course made it very clear that one of the teachers' needs was fulfilled. During this workshop, the NASE-Bolivia group gained in strength

and confidence taking on a unique characteristic, different from what was originally planned. The NASE-Bolivia is composed of members from different regions who come together when they are needed at the site of a NASE course. Although our country is not small territorially, at the institutional level it is.

2014 was a challenge because in two weeks two courses were taught. The first course was held under the auspices of the National Meeting of the Bolivian Society of Physics and took place at the UMSS in Cochabamba from October 27 to October 28. Due to the lack of time, we prioritized the astrophysics activities. And because of the large number of participants (128) the workshop was divided into three groups. Lessons learned from this experience:

- When there are too many participants, it is better to organize an additional course at a later time in order not to sacrifice quality for quantity
- Prioritize the attendance of teachers over other types of participants (in our case there were physicists and students of physics)
- The importance of having committed instructors
- The participants want to complete all the NASE activities

We also learned that we should have invited students on the verge of graduating from the normal schools (where teachers are trained). About 30 students in their last year at the normal school in Santa Cruz traveled to Cochabamba just to attend the NASE course. Their interest and sacrifice to attend the workshops were indeed touching. Their instructors expressed the need for these types of courses for new teachers.

Between November 4th and 7th in 2014, the NASE course took place in the city of Oruro. The course was coordinated by the office of the Vice minister of Science and Technology who took charge of the conference logistics and participant registration. Based on the experience in Cochabamba, we wanted to have a smaller and more manageable group, but still ended up with 68 teachers with a wide range of experience. Some of them represented teacher unions and were very critical at the beginning, however in the end they were happy and satisfied with the course content and its development.

The support of the vice-minister's office was invaluable. We experienced cooperation on every detail of workshop organization and the Director of Education from Oruro participated in this course. His happiness was evident. The main achievement of this cooperation with the Bolivian Ministry of Education was the first printing of the book entitled "14 pasos hacia el universo". The intention is to deliver the book free of charge to all public schools in the country.

However, there is still a small conflict with the office of the vice minister whose origin is in the lack of experience with this type of course. According to the Vice ministerial office, there is no need to train local people in order to expand the network of certified trainers which contradicts the nature of the NASE courses. The Vice ministry is also not willing to financially support NASE workshops because they are the project of a NGO, and that therefore it is NASE which should assume all costs, disregarding that the instructors are volunteers. There is a reticence to providing economic support. In any case, the experience of working with the vice ministry was positive, although in recent years the contact seems to be winding down.

The 2015 NASE course was planned for Potosí. Due to social conflict in the city it was difficult to organize a group of trainers for this course and it was canceled. This was worrisome, since we were used to being successful. But the situation helped us better understand the goals of

the NASE Bolivia members, to engage further with this project, and to solve problems.

The intention for 2016 is to teach the course in the municipality of Cobia in Pando, one of the least developed areas in Bolivia and with the lowest educational levels. The last years have seen the support from the local state government. This region of the country is keen on receiving any kind of academic activities despite being economically depressed and is therefore an ideal region for the NASE course provided that the necessary funds are available. We are also planning to teach the course in Cochabamba but this time under the auspices of a private university, which is currently estimating its feasibility.

Increasing quality in Educator training in Astronomy: Polo Casemiro Montenegro Filho Experience

Ana Maria Pereira¹; Fabiano Pavoni Nogueira ²; Janer Vilaça³

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In the year 2013, the basic course of Astronomy and Astrophysics Teaching proposed by the Network for Astronomy School Education - NASE, IAU, was promoted by Itaipu Technological Park Foundation - FPTI Brazil, through its science center, Polo Astronomico Casimiro Montenegro Filho - PACMF, this promotion also enabled its implementation in two Brazilian higher education institutions based in the cities of Uberlândia / Minas Gerais and Bauru / São Paulo.

In PACMF, the course took place between 5th and 8th August, with 28 teachers trained. The course was taught by two NASE teachers, which simultaneously trained local instructors PACMF and teachers of the following areas of knowledge: Natural Sciences, Physics, Mathematics, Chemistry, History, Geography, Biology and Pedagogy.

After that, the NASE methodology was used in the teaching-learning course in Astronomy of PACMF, reflecting positively on classroom dynamics, with personal and professional reflections. The inclusion of new activities from NASE course, allowed the upgrade, improving the methodological techniques, which led to changes in experience reports, and results of pedagogical practices of teacher students.

The main results obtained by NASE training were: consolidation techniques, resources and didactic models for astronomy education; the creation of a local group to train educators in the methodology; the generation of knowledge, authority and autonomy in actions implemented by PACMF team.

NASE report of Colombia

Orlando Méndez¹, Mauricio Giraldo², Angela P. Pérez³, Jhonattan Pisco⁴

¹Planetario Comarranquilla, Barranquilla, ²Planetario de Bogotá, Bogota, ³Planetario de Medellín, Medellín, ⁴Grupo Halley, Universidad de Santander, Bucaramanga, Colombia

LOCAL GROUP ATLANTIC

In the city of Barranquilla the courses NASE born as an initiative of the Education Secretary of the Atlantic Department; these courses were held during 2010 and 2011 where participation of 100 teachers was achieved during the two versions. It should be noted that at this stage by the IAU - NASE president Rosa M ROS and Vice President Beatriz GARCIA, was achieved the consolidation of a team composed by university teachers, secondary teachers and amateur astronomers of the city.

Starting in the year 2012 until 2015 NASE courses have been organized by the Planetarium Combarranquilla, attending 130 teachers from the city of Barranquilla and the Department of Atántico. NASE has been of great benefit to teachers who have received the course in several schools as Normal Hacienda, La Salle Institute, Normal Baranoa, Colegio Colon, College Humboldt where the development of astronomy activities have been flag program of these institutions.

On the other hand, the material offered by NASE has been used by teachers as support for the development of astronomy content that is included in the curricula of natural sciences and social sciences both primary and high school. As purpose Planetarium Combarranquilla for future years it is to continue doing this course as a means to contribute to improving the quality of education in the Colombian Caribbean region.

LOCAL GROUP BOGOTA

Bogota Planetarium, ruled by the District Institute of Arts, IDARTES, developed in 2014 and 2015 during NASE programmer, activities to bring teachers, students and professionals from different areas of knowledge to the teaching of astronomy applying its science and method.

At first this course was raised to teachers of grades of secondary education of departmental program hotbeds of astronomy clubs who coordinates the Planetary public institutions, but due to the rise and interest of different educational actors not only the call widened other grades (including preschool) but also other institutions, both private universities. During this process not only it has demonstrated the realization by teachers of strategies and topics learned in the course in their classroom activities but lately proposed as trainers course, thus showing the impact this program has had on the teachers.

During the 2014 the 49th course NASE was ruled by Beatriz Garcia and Orlando Mendez as master trainers and the support of the missionary team of the Bogota Planetarium. At that time we wereworking with 45 teachers.

During 2014 the 71st Course NASE was developed with Beatriz Garcia and Bogota Planetarium professionals who participated in the course of 2014, and a new team linked to the date as accompanist team trainer. Additionally, we have the collaboration of Dr. In solar astrophysics Santiago Vargas of the National University and included in one of the working groups involvement Degree in Physics Miguel Valvueno who gave us a talk about miscaarqueastronomy. For this version we had 39 teachers participating.

LOCAL GROUP MEDELLIN

In the city of Medellin has been developed NASE course for three years, from 2013 to 2016 with teachers from the community of Parque EXPLORA. NASE versions in Medellin have had the organization of the Metropolitan Technological Institute in partnership with the Medellin Planetarium.

In 2013: it was attended by 28 teachers and 16 instructors. In 2014 it was attended by 40 teachers and 14 instructors communities masters of Parque EXPLORA.. 2015: It was attended by 56 teachers from the communities of teachers and 23 instructors Parque EXPLORA and professional astronomers from the University of Antioquia, and local amateur astronomers.

LOCAL GROUP BUCARAMANGA

Halley Astronomy group and Aerospace Science Group of he Industrial University of Santander, developed the NASE project between 11 and 14 October 2015, at the the Faculty of Science, School of Physics. This course of teaching of astronomy was coordinated by Dr. Luis Núñez and Lic. Jhonattan Pisco, with the advice and assistance of Lic. Angela Perez, MD. Beatriz García and Dra. Rosa Ros

It was attended by 36 people dedicated to education and science education, in addition to logistics staff group Halley and Ing. Amanda Balaguera, general coordinator of projects of the Halley Group

Report of NASE in Cuba

Taymi García

Planetario de La Habana, Oficina del Historiador, Cuba

The first edition of the NASE course for teachers in Cuba took place in September 2014. The main goal of this course was to create and educate a local group of teachers. In turn, this group would teach and bring up to date other teachers and education related specialists. This course was the inspiration of several activities such as workshops, interactive talks and vocational training. Amongst these we can mention the children's Astronomy Workshop, "The Universe in your Hands", the teenage Workshop "Introduction to Astronomy" and the usage of NASE workshops in planning classes for teacher training. These include the subjects of Geography and Physics and activities such as thematic discussions carried out among first year Telecommunication students and at science congresses.

The teachers who participated in the course were able to apply the new acquired knowledge to various activities. Teachers and specialists from the museum and the Habana planetarium put to good use the lectures, workshops, and interactive talks, specially for two of the top programs at the Office of the City Historian, namely: the Social program for children and adolescents., and the social program for senior citizens.

In order to ensure continuity in the September 2016 program a second edition of the NASE course will take place with like for like results consistent with the first edition.

Experiencia de los cursos de Astronomía NASE-IAU en Ecuador

Nicolás Vásquez, Santiago Bernal

Escuela Politécnica Nacional, Quito, Ecuador

Astronomy in Ecuador and the Andean countries has been present since pre-Hispanic cultures until today. In the Inca culture, the stars were present in religion and agricultural calendars and directly influencing the social development of the inhabitants of the Tahuantinsuyo. Then, in the eighteenth century, French geodesic mission visited Ecuadorian territory for measuring the length of a meridian arc. In the Republican period, the Quito Astronomical Observatory was built as complement of the Escuela Politécnica Nacional and astronomy became a formal science.

To understand the impact of NASE courses in Ecuador, it is important to note that scientific activities are concentrated in the capital, Quito. In this town, although relatively small they are located three planetary and the universities where astronomy is taught formally. However, astronomy is quite distorted, their study in schools and colleges is part of social science subjects.

The NASE-IAU courses in Ecuador began in 2009 in the city of Salinas in the Ecuadorian coast. Then, since 2012 the NASE courses have been hold in Ecuador until today. Of the 6 courses NASE conducted in Ecuador, three were organized in the city of Quito, where we work with students of the career of Physics of the Escuela Politécnica Nacional to generate new instructors and to extend courses to other parts of the country.

One factor that should be considered specifically in the case of the NASE courses in Ecuador is the geographical position. In our country we need to include certain topics within the course such as the Coriolis force and its effects which are targets of misinterpretations

NASE report in Guatemala

Edgar Aníbal Cifuentes Anleu

Escuela de Ciencias Físicas y Matemáticas, Universidad de San Carlos de Guatemala

We have done the NASE course in Guatemala for five years, from 2012 to 2016 in Guatemala City with different target groups.

PARTICIPANTS

2012- The first target group was the high school teachers in service, but unfortunately could not work with them for problems, which were at that time, between the Ministry of Education and the University of San Carlos of Guatemala (42 participants)

2013and 2014- Our second target group was school teachers who teach courses Natural Sciences, which included a small content of astronomy, this idea did not work very well because despite the enthusiasm of the participants for their training area astronomy was very low and their capacity to assimilate and especially playing the course was not as expected. (48 participants in 2013 and 116 participants in 2014)

2015 and 2016- The third target group are students and teachers of secondary education in physics from our University and Landivar University along with other school teachers who came to us thanks to the presence of information in social networks, with the latter group the level of understanding rose and they have replicated some of the content in their workplaces. (56 participants in 2015 and 42 participants in 2016)

INSTRUCTORS

The plenary sessions were taught by teachers from the ECFM who have experience in Astronomy Sciences, while workshops have been mainly by our students that already have a good training in physics and astronomy but still lack teaching experience; we hope to improve in the future.

Report from NASE in Honduras

Ricardo Pastrana

Universidad Nacional Autónoma de Honduras, Tegucigalpa, Honduras

At the beginning of 2011 we received an invitation from NASE president Dr. Rosa Ros to join the Network for Astronomy School Education, which we immediately accepted, with enthusiasm at being able to collaborate on a global education project. During April 27 and 28 of the same year, we organized a pilot workshop for 16 instructors from the Department of Astronomy and Astrophysics of the School of Space Sciences (FACES) at the National Autonomous University of Honduras (UNAH), and whom we would incorporate into the local Hondura NASE group.

Between July 11 and 14 of 2011 we organized the 1st Honduras International NASE workshop, which was also the 10th NASE workshop. This conference was attended by 51 primary and secondary public school teachers from around the country.

During 2012 a memorandum of understanding between FACES/UNAH, the Honduras Secretary of Education and NASE/IAU was finalized, and which was signed during the Council of Ministry session on Tuesday, 9 October of 2012; and witnessed by the President of the Republic of Honduras.



Fig 1. The cooperation agreement was signed by the Rector of UNAH Julieta Castellanos (on the left) and the Minister of Education Dr. Marlon Escoto (on the right). The President of the Republic (in the centre) signing in their capacity as the honourable witness.

On July 9 to 12 of 2012 we organized the 2nd NASE-Honduras workshop, which was also the 18th International NASE conference. On this occasion, we had 66 participants, also from different regions of the country.

The 3rd NASE-Honduras workshop (NASE's 40th) was held on the 4th to 7th of November, 2013, attended by 45 teachers of Natural Sciences, Mathematics and Social Sciences. .

The 4th NASE-Honduras workshop was held on October 23 and 24 in 2014, for 16 instructors from the Experimental Education Center of te UNAH. At the end of this year, we requested an extension to the memorandum of understanding which in 2015 was granted with a duration of three years. In 2015, 39 teachers participated in the August 24-27 5th NASE-Honduras Workshop (NASE's 76th).

The NASE-Honduras team is composed of instructors from the Departments of Astronomy and Astrophysics, Archaeoastronomy and Cultural Astronomy; the academic degrees held by team members are: 1 PhD, 11 Masters and 7 Bachelors.

From 22-25 August of 2016, 52 teachers attended the 6th workshop, which was the 86 international one. This time, although all the teachers were from the capital city, Tegucigalpa, they came from five different school districts, selected according to participant profile.

In summary, we signed two international agreements implementing NASE-Honduras, and between 2011 and 2016, we have provided instruction to 322 public school teachers. At the present time, the NASE-Honduras team is comprised of instructors from the Departments of Astronomy and Astrophysics and Archaeoastronomy and Cultural Astronomy. We have 18 NASE instructors who are responsible for providing the workshops, conferences, laboratories, astronomical observation and the archaeo-astronomy activities.

The Secretary of Education is responsible for selecting the teachers, taking into account the criteria established by the NASE-UNAH Commission and the Ministry of Education. Participating teachers must have teaching assignments in the classroom, and cannot be administrative personnel, in addition, they must not be near retirement and must teach either natural sciences, mathematics or social sciences because these are the areas that according to the National Basic Curriculum of the Ministry of Education teach astronomy topics.

Within the established criteria, teachers cannot repeat a workshop, and we maintain a database to ensure this is the case. The Secretary of Education receives a summary of each workshop, listing the participating teachers, which enables them to avoid duplication.

We have organized workshops at different times of the year, but feedback from participating teachers indicate that workshops held mid year are more useful because it coincides with the curriculum schedule, and thus, they are better prepared to teach astronomy.

Participants receive a certificate from NASE, and which, as per the agreement, is recognized by the Ministry of Education. In a few situations, when a participant may require additional documentation, a certificate of participation is provided. Generally these are for participants who work in private schools.

In the course evaluations participants indicate that they like the workshops because they are very hands-on (practical) and do not focus on lengthy theoretical presentations.

NASE in Mexico: beginning of expansion

César Augusto Mtz Rocha

Universidad Autónoma de San Luís Potosí, San Luís Potosí, México.

Learning about the sky is important not just for those who investigate the Universe's celestial objects, it is much far more ancient and essential and is integral to human beings and their civilization, and in Mexico, this tradition dates from its pre-hispanic cultures, and whose legacy has survived the passage of time and cultural fusion.

Astronomical sciences are less known, and although many people often speak of 'time' or 'space' with respect to the sky, they have very poor understanding about these concepts. They mix terms like weather, climate, climatology, astronomy, meteorology etc. However, today's youth preferentially turn to their mobile devices before looking up at the sky, and little by little we have distanced ourselves from the celestial beauty, deprived of its messages.

The arrival of Network for Astronomy School Education, NASE, provides an opening to rescuing this science and bringing it back to the classroom. The first attempt in 2013 formed the core group, piquing the interest of teachers. After a period of inactivity, the second workshop took place in 2016 hosted by the School of Engineering of the Universidad Autónoma de San Luis Potosí, reinvigorating the core group, ready to join forces and expand throughout the country.

After the May and June workshops, the NASE group has looked to involve more regions of the country, taking advantage of close allies. In this way, in four months presentations have been made at national forums such as the National Colloquium of Informal Science and the National Conference on Science Dissemination of the Mexican Society of Physics, and through electronic media from which interest surged from seven of the thirty two States of the Republic of Mexico, which are strategically located, allowing the rapid expansion of the program. This has resulted in courses in the city of Zacatecas, Zacatecas, and Morelia, Michoacan, with plans for a third in the City of Villahermosa, Tabasco, in the center, south and southwest respectively, for March in 2017.

IN tandem with these efforts to organize workshops in Mexico, we have reached out to institutions, universities and science and technology agencies which can help expand NASE. We have established a course in cooperation with the Preparación de la Observación con el Museo Laberinto de las Ciencias y las Artes, in the context of the Global Week of Space in Mexico, and a permanent course in Positional Astronomy at the School of Engineering of the Universidad Autónoma de San Luis Potosí.

With the goal of presenting the advantages of the workshop to those interested in NASE, there will be one more workshop at the end of October in San Luis Potosi for all national leaders who could support and easily replicate the course at their institutions and home locations.

These actions will delineate, without doubt, the undisputable growth of NASE in Mexico.

Evolution of NASE workshops between 2010-2016 in Nicaragua

Ligia Areas

Universidad Nacional Autónoma de Nicaragua, Managua, Nicaragua

Since 2010 the Astronomical Observatory of the UNAN-Managua has organized NASE workshops every single year, thanks to the support from the National Council of Universities (CNU), the National Autonomous University of Nicaragua (UNAN-Managua) and on occasion, from the Nicaraguan Council of Science and Technology (CONICYT).

The Astronomical Observatory of UNAN-Managua has organized NASE courses from 2010 to 2016, demonstrating its commitment to Astronomy education. This agreement was formalized through a four-year memorandum of understanding between MINED (Ministry of Education), UNAN-Managua and the International Astronomical Union (IAU) through NASE. The first year MINED provided lodging and selected the teachers from different regions of the country.

During the period 2010 to 2014 the NASE courses were held in Managua, participating were teachers from different parts of the country, university instructors and university students. UNAN-Managua has four regional campuses located in the cities of Estelí, Matagalpa, Carazo and Chontales. Taking advantage of this structure, we will provide NASE courses in each of these regions. In 2015, we held the VI NASE workshop in Managua with the collaboration of the Multiregional School of Carazo (FAREM-Carazo), while in 2016 we were in the city of Estelí, in the Multiregional School of Estelí (FARME-Estelí). It should be noted that the participating teachers represent diverse districts in each region. We highlight that during these seven years; personnel implementing the NASE courses are professors, students and docents of the Physics Department, who are trained by Astronomical Observatory staff.

In our country outstanding associations of amateur astronomers give presentations on topics associated with astronomy when there are events such as eclipses, meteorites, meteor showers etc.

Following is the mission and vision of our Astronomical Observatory

MISSION

The Astronomical Observatory of UNAN-Managua is an academic unit dedicated to teaching and research in the field of Astrophysics and Astronomy with the goal of contributing to the scientific education of our institution's students and of the general public.

VISION

The Observatory must become an academic unit for research and teaching in the field of Astrophysics and Astronomy at the national level, and be recognized at the regional level for the quality of its projects.

With the objective of fulfilling this mission and vision, the Astronomical Observatory has been implementing courses on Astronomy and Astrophysics teaching, with laboratories corresponding to the NASE activities such as:

1. Professional development of primary and secondary school teachers
2. School visits to the Astronomical Observatory
3. Visits by our staff to Normal schools (where students are prepared to be primary education teachers)

In 2009, the curriculum for 5th and 6th grades in primary school, and 7th, 8th and 9th grades in high school was transformed. The MINED introduced fundamental concepts in Astronomy, which are taught in a Natural Science unit.

In 5th grade, Unit VIII, titled “The Earth is our Great Home” is taught in 24 contact hours. One contact hour is equivalent to 45 minutes. This unit has 8 themes, and only three are related to Astronomy:

1. The internal structure of the Earth: core, mantel and crust
2. Incident solar light during Earth’s orbit
3. Solar and lunar eclipses

In 6th grade, the final year of primary school, Unit X, named “The Universe”, is taught in 12 contact hours, whose content is related to

1. Explaining theories on the origin of the Universe
2. Describing the content of the Universe, with emphasis on its properties and composition.

What are the properties of the Universe?

- What is it made of?
- What are galaxies and what are their structures?
- What types of galaxies are there?
- What are stars and how are they classified
- What is the name of the star in our planetary system?
- What are the names of the group of stars that look like animal figures, object and persons?

3. Explain the properties of the Milky Way Galaxy

Unit VIII is taught in Physical Science in high school 7th, 8th and 9th grades for a total of 6 contact hours. The following table demonstrates the number and name of the Physical Science unit, the number of corresponding contact hours and the content by grade.

In order to provide teachers with the knowledge to teach Physical Science courses, we have established the following objectives:

1. Develop skills and creativity in the mastery and teaching of Astronomy topics
2. Provide the content knowledge and practices for teaching the themes of Astronomy and Astrophysics in the Ministry of Education’s physical science curriculum for grades 5, 6, 7, 8 and 9.

To achieve these objectives we describe the structure of the NASE courses:

1. Four lectures: Solar System, Evolution of Stars, History of Astronomy and Cosmology
2. New Activities: local horizon and solar clocks, simulation of the motion of stars, the Sun and the Moon, planets and exploits, Earth-moon-Sun system (phases of the moon and eclipses), the solar spectrum, sunspots, life of stars, the invisible Universe, the

- expansion of the Universe and the young astronomer’s backpack.
3. Three Group sessions
 1. Observing preparation, planispheres, telescopes, and free astronomical software
 2. Astronomy in the City
 3. On the teaching of astronomy in Nicaragua
 4. Observing nights using telescopes

Grade	7 th	8 th	9 th
Number and Name of Unit	Unit VIII: The Earth is a Living Planet	Unit VIII: Our Solar System	Unit VIII: Our Solar System
Number of Hours	6 contact hours	6 contact hours	6 contact hours
	<ol style="list-style-type: none"> 1. The Earth <ol style="list-style-type: none"> 1.1. Importance 1.2. Position 1.3. Motion 1.4. Structure: External and Internal 2. Rocks <ol style="list-style-type: none"> 2.1. 2.1Classification 2.2. 2.2 Rock formations in Nicaragua 3. Measures of Conservation and Preservation 	<ol style="list-style-type: none"> 1. The Moon <ol style="list-style-type: none"> 1.1. size, motion, phases 1.2. eclipses 1.3. Effect of the Moon on tides 2. The Sun <ol style="list-style-type: none"> 2.1. Composition and Structure 2.2. Benefits and Dangers 2.3. Importance for Life 2.4. Sunspots 2.5. Eclipses 2.6. Apparent Motion 3. The Solar System <ol style="list-style-type: none"> 3.1. Planets 3.2. Properties 3.3. Comets and Meteorites 3.4. Black Holes 	<ol style="list-style-type: none"> 1. The Universe <ol style="list-style-type: none"> 1.1. Big bang theory and expansion 1.2. Distance measurements 1.3. Interstellar space 2. Galaxies <ol style="list-style-type: none"> 2.1. Composition, shape, size and motion 2.2. Magellanic Clouds 2.3. quasars, pulsars and black holes 3. Stars <ol style="list-style-type: none"> 3.1. properties 3.2. classification 3.3. Evolution 4. Constellations <ol style="list-style-type: none"> 4.1. Properties

ACHIEVEMENTS

1. The content of NASE courses as well as the lectures and activities, promotes understanding of the topics in Astronomy and Astrophysics outlined by the Ministry of Education.
2. Schools lack laboratories and the NASE activities enable development of skills and creativity in the mastery and teaching of Astronomy concepts.
3. Teachers and students from around the country as well as university students and instructors have benefited from the workshops and program implemented.

Feedback from participating teachers

1. The changes in the curriculum have led to certain difficulties in teaching the content and in teaching assignments. One difficulty is being assigned to teach a subject out of

- an instructor's area of expertise, and professional development was not available before the changes, and further, there is little time to teach all the content.
2. Teachers who are not specialists, e.g. chemists, biologists, mathematicians, etc., are assigned to teach physics.
 3. Much of the NASE content was not studied at university
 4. Some of the teachers defended the curriculum transformation pointing out that this new education vision is innovative and focuses on intersdisciplinarity, the challenge for the teacher is to find teaching alternatives.
 5. The physical science textbooks are too simplistic and suffer from serious errors. Many serious conceptual errors were found in the 8th and 9th grade texts. Some of those false concepts are now obvious, due to the NASE course.
 6. The workshops should be held during vacation as not all teachers can count on obtaining leave from their MINED representative.
 7. Everyone was pleased with the NASE course itself.

Report NASE in Panamá

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In July 2011 the first workshop of NASE was jointly held by the Panama University (UP) and National Science and Technology Secretariat (SENACYT).

Susana Deustua, Ricardo Moreno, and Rosa Maria Ros, members of NASE, along with the other five professors of the UP, were the main speakers. The teachers associated to SENACYT attended a course that lasted for three days, and two courses of night sky observation. The participants also visited the Astronomical Observatory of Panama located in the district of Penonome of the central province. Theoretical topics include: Stars Evolution, Cosmology, History of Astronomy and Solar System

The following are the practical topics of workshops done during different sessions: Local horizon and sundial, Motion simulators, Earth – Moon – Sun system: phases and eclipses, Young Astronomers backpack, Solar spectrum and sunspots, Lifecycle of Stars, Astronomy beyond visible light, Expansion of Universe, Planets and Exoplanets, Preparation for Observations: software and Telescopes. Group discussions regarding Astronomy in the City, Archaeoastronomy, and Astronomy teaching in school were parts of this course.

This workshop was a success, due to its goal to promulgate the teaching of astronomy with low costs and easy-to-get materials. Most of the 50 teachers, who attended the course, were from Public Schools.

Unfortunately it was not possible to follow up with the usage of low cost materials by attendees because the contact information with most of teachers was lost. However, it's known that some of the attendees used it in certain teaching activities, such as the ones about the origins of craters on the moon and the Earth-Moon system with a meter stick. Unfortunately there is no recorded evidence to back this claim.

For different reasons we are not able to repeat this activity at a regular basis, but we will try to overcome the obstacles to make it happen, if Panama University, Ministry of Education, and NASE could come up to an agreement.

Report NASE Paraguay

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in Paraguay we have taught the NASE course in 2012, 2014, and 2016. Due to internal problems at the university, we were unable to teach the course in 2013 and 2015, but every time the course was a complete success.

- 2011- the first group had more than 50 high school teachers who specialized in physics, chemistry and natural sciences. they were divided into two groups. in this opportunity a contract between the university, the "supervision educativa " under the jurisdiction of the ministry of culture and education and the NASE representatives was signed.
- 2012- our second group was also composed of 50 high school teachers specialized in physics, chemistry and natural sciences and they took a four day course.
- 2013- due to internal problems at the university, the course was not given.
- 2014- this year the course took place during the FACEN science week. Which made it difficult for high school teachers to attend because of the additional workload. Many teachers were unable to attend due to the lack of substitute teachers. We decided to go ahead with the course by inviting students who were in the last years of the physics major and of the education program.. The students came from both the FACEN and the Institute for Advanced Education and they were very excited about having the NASE course taught at the institute in the future.
- 2015- - due to internal problems at the university, the course was not given
- 2016- for the first time we decided to teach the course in Villarrica, a city located 165 km away from the capital city Asuncion. The course took place on three consecutive Saturdays with the instructors traveling back and forth from Asuncion. We had 35 teachers from both primary and secondary schools who specialized in the basic sciences and technologies. Despite the fact that their astronomy and physics knowledge was not too deep, they were very interested and proactive during the activities.

INSTRUCTORS

Both the lectures and workshops were taught by professors from the School of Exact and Natural Sciences of the National University of Asuncion (UNA) All of them hold a degree in physics and have a lot of experience in astronomy, some have worked in astronomy in the past and others are amateur astronomers.

Reassessing Inca's Knowledge of Astronomy Through the NASE Program in Peru

José Kaname Ishitsuka Iba

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Although the ancient inhabitants in Peru had a vast knowledge of astronomy, currently there is not even a university where you can study astronomy. We are few astronomers in Peru and studied astronomy abroad. Needless to say, the level of teaching astronomy in schools is really alarming.

There is an urgent need to improve the quality of education, especially in astronomy. At all levels of education; primary school, 6 years and secondary school, 5 years.

The Geophysical Institute of Peru (IGP) has a planetarium at the city of Lima, with capacity for 40 people, it is the product of the donation of the Japanese government, it went into operation in 2008. The Planetarium was under the direction of the Astronomy Division until the early of 2015, then for inexplicable reasons, it was assigned to other division. The Planetarium was conducted by three people, all graduates of the career of Physics of different national universities. From 2011 to 2013 we had the support of Miss Shiomi Nemoto, Volunteer of the Japan International Cooperation Agency, JICA.

Huancayo Observatory is one of the IGP's observatories, located 300 km east from Lima, at 3,300 meters above sea level and it is currently the headquarters of the Astronomy Division. On the other hand at less than 3 km there is the Radio Astronomical Observatory of Sicaya (ROAS), it was a Satellital Communication Station of a Telephone Company in Peru. The Satellital Station was transferred to IGP in 2008 and is about to become a radio observatory with a 32m parabolic dish.

In 2014 we received the proposal to perform a NASE Workshop and achieved it between 17 and 21 of March of 2014 at the Radio Observatory, it was performed in coordination with the Local Education Management Unit of Chupaca (UGEL Chupaca), participated about 50 teachers of sciences course of various schools affiliated to the UGEL Chupaca. From NASE came Rosa Ros and Susana Deustua as instructors, and assistant instructors were: José Ishitsuka, Mario Zegarra, Nobar Baella, Adita Quispe and Orlando Martínez. Shiomi Nemoto of JICA as an observer and for support.

A couple of days later we moved to Ica (300 km south of Lima) where we performed one more NASE Workshop, in Ica the Astronomy Division has a solar observatory managed in collaboration with the San Luis Gonzaga de Ica National University. Coordination were made with the Regional Education Direction and the Faculty of Science of the University of Ica. The active participation of the Dean of the Faculty of Sciences Mg. Nestor Vargas allowed success in organizing and performing the workshop. As assistant Instructors we have Yovanny Buleje from Ica University plus all members in Huancayo's workshop. A NASE office was implemented at Huancayo Observatory in order to guide teachers that attended the NASE workshop.



Photo 1.: NASE office to guide teachers at Huancayo Observatory

Between July and September 2014, a Post-NASE 2014 activities were organized with the aim to see how far the knowledge imparted in the workshop NASE 2014 were applied at schools, during 6 weeks we visited all schools where teachers participated the NASE-2014. In order to enhance knowledge in astronomy we took the 3D System Universe (Nemoto, S. et al., 2014, Kokubo, E., et al., 2005) and some telescopes for night observations. We visited 24 schools located in 14 different towns, reaching 5,050 people.

Then between February 9 and 13 of 2015, we performed the second NASE workshop but in Lima, at the town where the Planetarium is located. En march the Planetarium ceases to belong to the Astronomy Division. It was the last NASE Workshop.

DISCUSSION

4. It was considered important performing of NASE workshops in Peru because:
 - A. It will allow to improve the level of teaching astronomy in schools in Peru.
 - B. Assistants instructors that latter will become instructors of NASE, would enhance and improve their knowledge of astronomy, especially planetarium staff, because they must be updated in astronomy.
5. It has been found that only performing one workshop is not enough, the knowledge imparted in the workshops are not being transmitted to students. Proof of this is that despite setting up an office to clear doubts of teachers about astronomy, there was not a single visit. (Photo 1).
6. The workshop NASE must be reinforced with activities as performed in the Post-NASE 2014. We can get massively but requires much effort and an organized team.
7. Fortunately the NASE system is flexible enough that allows variants, as in our case allowed us to make the Post-NASE 2014. Each country where NASE is performed, is unique and therefore the NASE Workshop must be adapted to each country.

In case of Peru we should put emphasis on the topic: Doing astronomy in Your neighborhood, focused on archaeological ruins of Pre Inkas or Inkas edge, also before the Pre Inkas (2 000

B.C). Peru is rich in archaeological ruins and in many cases poorly studied, and this will allow small research themes in schools. In Peru there is the oldest Solar Observatory of America (Ghezzi, I., Ruggles, C., 2007).



Photo 2.: Chakillo the oldest Solar Observatory in America Sun rising on April 7th of 2016

CONCLUSIONS

1. NASE Workshops in Peru should be continue, as it has been doing.
2. The NASE Workshop also is good to improve the level of knowledge in astronomy for NASE instructors, especially personnel involved in planetariums, for example.
3. The Post NASE is a good way to strengthen the knowledge in astronomy. The 3D System The Universe is very good mean to give basic knowledge of astronomy, also is massive. It must be supplemented with the use of telescopes, people like to see through them.

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Report on NASE in Spain

Rosa M. Ros

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Up to 2016 we have not started NASE activities in Spain. In fact just we have not started courses in Europe for the moment, except for a pilot course organized in 2014 in cooperation with the European Association for Astronomy Education (EAAE) in the Romanian city of Cluj. We want to continue to maintain this collaboration with EAAE in Europe in the interest of both institutions.

The Spanish course was held in Pamplona in collaboration with the University of this city and has formed a working group in order to continue giving courses in the future. The organization of future courses in collaboration with the Yebes Observatory (near Guadalajara) is also planned. At present the objectives are to provide courses in areas somewhat remote from large urban areas that already have many training options for teachers

The truth is that there is a good group of Spanish instructors involved in NASE who have been working outside their country, in other Spanish speaking countries, so the formation of local groups in Spain is expected to be fast and efficient because we have raw material. Below are some comments from participants attending the course.

Many attendees mentioned quality of materials used and highlighted the knowledge and preparation of instructors who gave workshops and conferences. For example, a participant said, "theory is best understood participating in workshops" and another said "conferences and workshops are applicable to observation and help learning orientation in the sky" allowing a new approach to teaching astronomy following the methodology of NASE.

A primary teacher ask for "more practical and simpler activities" for his students. This indication is very common in many courses, requested more and more workshops with more and more activities. It is within the context of supplementary materials where you can have extra activities and materials as requested by participants. All NASE members are invited to prepare and facilitate new creative, interesting and useful activities.

Uruguay report

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NASE workshops in Uruguay began in 2012. The co-organization of the annual meetings of NASE including national teachers in Uruguay to develop Astronomy activities related to its procedural, attitudinal and conceptual contents aimed at different target populations has improved the systematization and reflection on our practices, the resources share, and to pay attention to the presence of Astronomy in our daily life.

Product of the latter, a survey of existing sundials in different cities and places of our country, architectural discoveries, registration, study and analysis of its construction, historical search of its origin, reconstruction or renovation in several cases has to be performed. Interdisciplinary work from different knowledge fields allowed a synergy between esthetic, geographical location, coordinates, calculation, orientation, natural and standardized measurement of time, related software management take place. The construction of sundials as souvenirs was also improved.

Another activity that was developed at the time was related to urban place names, their meanings, connotations and implications. Place names are a cultural expression that denotes the characteristics of a society and its historically contextualization. Our country has several places where there are streets named after constellations, stars, planets or asterisms. To identify existing urban place names, those nouns that have astronomical roots, locate place names identified in the plan of the city, use the google earth, hiking recognition for the purpose of knowing the location and spatial distribution of themselves, and to investigate the origins of the existence of such place names, involves the description of these objects, the underlying premise of community projects to make plaques with the names and a brief explanation and make reports available to the public, and tourists in native language and a second language, stimulate many skills that allow an interdisciplinary work.

Lately we are working on the proposal for an astronomical tourism beyond the beach tourism in our country and preserve our cultural natural heritage increasing dark skies reserves. We also put in practice formative science camps, introducing Astronomy in addition to other sciences like biology, physics and chemistry. Observation with the naked eye and telescope, orientation, measures with a gnomon, the construction of small instruments and astrophotography usually take place in this formative camps for teachers to be.

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